

Interactive comment on “Linking catchment hydrology and ocean circulation in Late Holocene southernmost Africa” by Annette Hahn et al.

Anonymous Referee #2

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The study encompasses an impressive variety of methodologies and of different proxies, and discusses the rich results in a convincing way, especially for what regards the aridity-humidity multi-proxy reconstruction. An undoubtable strength of the approach is the analysis carried out in samples from several places in the Gouritz catchment, which provides decisive supports for the inferences made. I would recommend that the manuscript be published, although prior to that the authors should improve a few aspects of it, and respond to some questions that I detail below. General reservations that I have with this work are: 1) a better effort could be made of emphasizing, especially in the abstract and introduction (and potentially also in the title), what the key findings are and what their importance is. As it is it resembles more an account of analyses carried out in a very good setting (whose importance could be made even more clear). 2) It would be very interesting if the authors could draw more explicitly the

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implications of their results, and/or of the conceptual model they somehow validate, for the latitudinal shifts in ITCZ. This is of interest to a larger climatological community, and to projections of what the region may expect with ongoing climate change. 3) the paper is very wordy, especially in its sections 2 to 5. The authors should improve readability and really consider refraining from reporting all they have done and all results, and focus of what is of relevance to the new findings discussed. Some records barely matter for the discussion. 4) Probably because of the vast amount of material presented, the manuscript is sloppy in many parts: odd sentences, mismatches in the wording, punctuation, typos. One would expect that nine authors could proofread the manuscript to a higher quality.

Main specific points

* The first sentence of the introduction seems inconsequential and unjustified to me: there is no argument for the importance of South Africa's geographic position. Rephrase. * I would suggest to pay more attention to streamlining the introduction chapter: as it is it is hard to read, and the main points that the authors wish to make do not come through clearly. What are the main research gaps regarding South African climate? Can you present the evidence for one or the other explanation in a more organized manner? * I would recommend an effort to focus section 2. It could be made more concise, and thus the readability of the paper could improve, if you privilege the information that is relevant to the findings of this paper. E.g., the reader doesn't gain insight that are relevant to this Late Holocene paper by your discussing Cretaceous tectonics. * Fig 4. The LIA follows the MCA, not the other way around. * Pag 14 line 2 and following. First, from fig 5 one would say that all discussed changes happen from ca. 950 yBP, rather than 1150. Can you clarify whether the figure or the discussion are correct? Further, I don't think you can state that anything happens to the SST record around 1150 yBP, at least from the results contained in fig.5. Simply the sampling temporal resolution increases, but I would argue there is no real difference in variability before and after 1150 kBP. If anything, low peaks appear after that time: could you

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show a real statistical significance between the average SSTs either side of 1150kBP? * (related to one of the main objections of reviewer 1) You state that age-reversals occur from 650 yBP, but from figure 5 one can see that you take data up to ca. 500 yBP seriously (also the gray band starts at 500): can you clarify? * Pag 14 ll 27-28. For intensification of Agulhas Current transport, you should check Durgadoo et al (2013), who report, from three ocean models, that northward shifts (and intensification) in atmospheric features increase Agulhas Current transport contrary to what included in the conceptual model here discussed. This does not mean that ocean models in the above studies hold the truth, but I would suggest you could take the occasion to discuss this contradiction in the literature. (also in the Conclusions) * Pag 16 line 10. Future climate change may follow what pattern? You reported two. Also, could you provide a reference supporting this? (rephrase anyway, as sentence is confused)

Minor comments:

* The title could be modified to eliminate the present continuous tense – vague – and include any word that reports the results of this “linking” * Abstract: “highly dynamic” and “highly complex” used just one sentence apart, maybe either make more specific or eliminate one. “give information on climatic changes”: it is vague, make more concrete. The last sentence is unclear: to which processes do you refer, to those in the LIA or in the MCA? Rephrase. Also, probably not appropriate to only refer to a climate model like this at the end of the abstract, where the reader cannot make much out of it: essential information is missing. * LI 9-12. This sentence is complicated and doesn’t show a contrast between concepts that one would expect from the use of “while”. * LI 16 ITCZ not explained, maybe avoid abbreviation as never used anymore. * LI 16-18 you either use whether, or add a question mark, not both. * Page 3 line 4. Durgadoo et al 2013 find precisely the opposite, i.e. that Agulhas leakage increases when westerlies move north. I would suggest you deal with this in the introduction. * line 6. What is YRZ? * LI 16-17. Odd phrasing, a sediment core doesn’t aim to anything. * Line 28. Harmonize the units (use exponential in place of Mm3) * Line 32. What do you mean

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by mixed summer and winter rainfall? And why this single paleo piece of information in a present-day context? * Page 6 ll 15-16. Sentence not clear: what is the unit for the numbers in parenthesis, years? (14C should have 14 in the superscript) * Dewar et al 2012 is missing from the ref list. * Line 17. Why do you inform about the sedimentation rate: this is not further discussed in the paper. * Line 21. Analyses. * Line 24. Change “elemental profiles” in place of “scanning data”. * Line 27. Change “vertical resolution or downcore resolution” in place of depth resolution. What are 1.2 cm²? * Line 3. Change “scanning intensities” for a more appropriate term * Pag 7 ll 4-5. Not clear how the xrf data helped in selecting the samples for organic geochemistry, please reformulate. * Methods: try to avoid so many abbreviations, especially those not further used in the paper. In general the manuscript is highly packed with abbreviations, please try to be parsimonious with them. * Pag 9 line 16. “micropaleontologically” probably not a word. * Pag 10 line 2. “None of the considered taxa was found to correlate”. * Line 4. What do you mean by point counted? * Line 15. Same reference occurs twice. * Line 20. Fig S4 does not exist. * Pag 14 ll 15-17. The reader gets the impression that the MCA is a Southern African phenomenon, while this is a concept normally applied north Atlantic records. Please rephrase. Also, punctuation is jumbled. * Line 30. “serves as data to validate”, not really clear, could you reformulate? * Pag 15 line 19. An anthropogenic signal shouldn't be expected only for the recent decades, as humans and colonization of South Africa were active (and potentially modifying the vegetation) also during the LIA, please check/reformulate. * Conclusions: please reconsider the use of resounding wording like “unique” (twice; surely this is not the only record to report SSTs along with terrestrial proxies), “not only” * Caption Fig. 4. Explain what the 10,000 iterations are. Also, please turn the numbers of the y-axis by 180 degrees. * Fig 5. Why no LIA grey block until the right part of the figure? It seem that the last curve to the right extends into the future. MCA and LIA colour references in the caption are wrong. Also, you plot PCA but refer in the text to PC1. In general, check the wording and concordance between caption, figure and what reported in the main text, as there are several mismatches. Since there are many proxies, you should avoid confusing the

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reader with slightly different wordings. * Fig. S2 contains mistakes: commas instead of points, no units for temperatures, BIT-index instead of BIT.

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